Recent Anomalies in Great Lakes Ice Cover Based on Statistical Analysis and Observation

G.A. Leshkevich[1] and S. V. Nghiem[2]

[1]NOAA/Great Lakes Environmental Research Laboratory
2205 Commonwealth Blvd., Ann Arbor, MI 48105
Phone: 734-741-2265, Fax: 734-741-2055
E-mail: george.leshkevich@noaa.gov

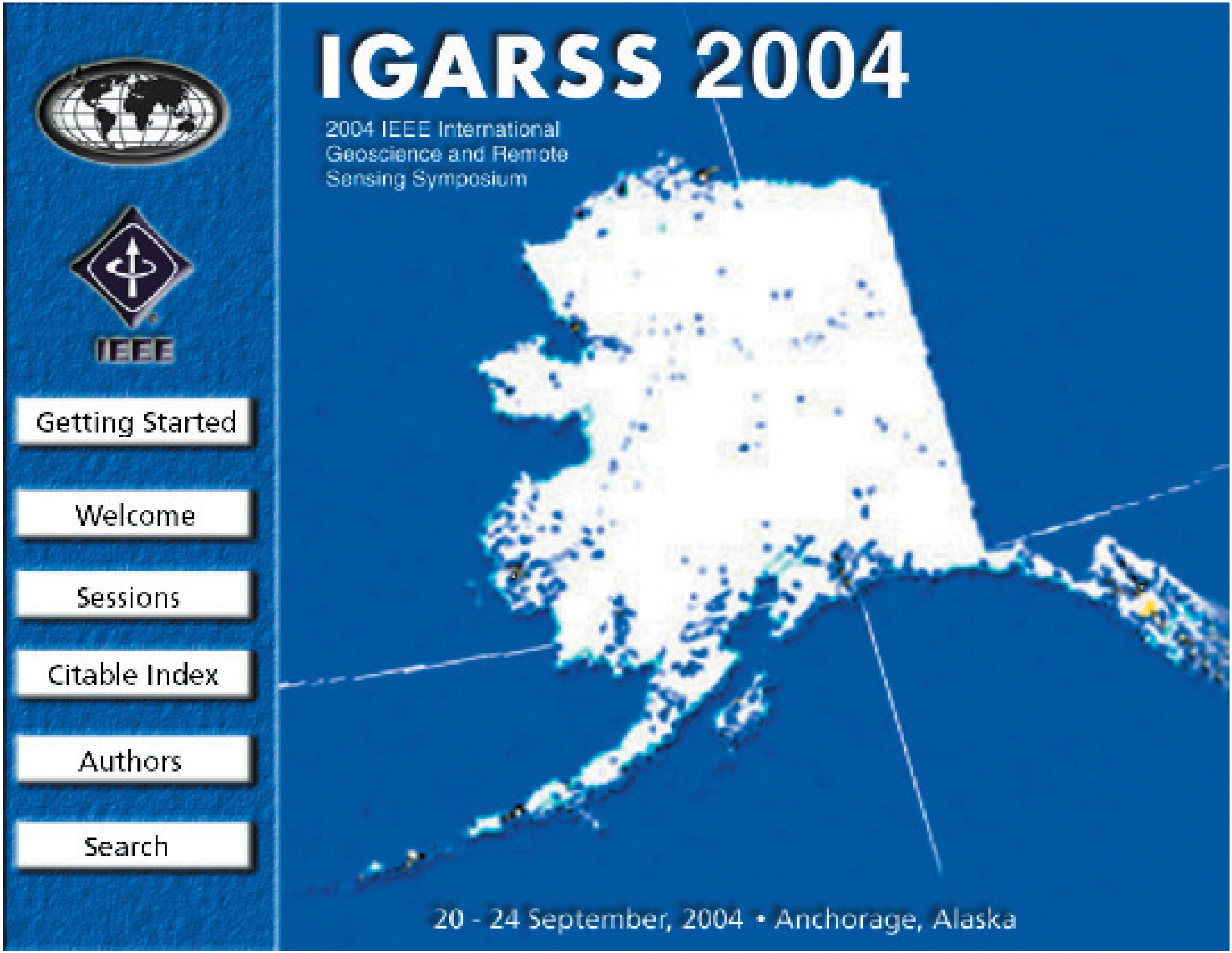
[2]Jet Propulsion Laboratory, California Institute of Technology
MS 300-235, 4800 Oak Grove Drive, Pasadena, CA 91109
Phone: 818-354-2982, Fax: 818-393-3077
E-mail: Son.V.Nghiem@jpl.nasa.gov

The Laurentian Great Lakes, the world's largest freshwater surface with a drainage basin extending 1110 km north-south and 1390 km east-west, have a combined surface area of about 245,000 km^2, a combined volume of approximately 22,800 km^2, and contribute significantly to economic and social activities of North America. The Great Lakes region provides 20% of the United States gross national product and is where one in eight Americans live. Ice cover in the Great Lakes, the most obvious seasonal transformation in the physical characteristics of the lakes, has a major impact on the regional climate, local commerce, and public safety. Lake ice is a sensitive index of regional winter climate. In a recent study [1] based on observed annual maximum ice cover (AMIC) from 1963 to 2002, it was found that the average AMIC of the five Great Lakes over the past 40 winters averaged 57.7%. It was at a maximum of 97.4% in 1979 and was at a minimum of 14.8% in 2002. Winter 2002 set a new record low AMIC, and the 5-year (1998-2002) running average AMICs is the lowest on record. However, during winter 2003, the Great Lakes region sustained anomalous and prolonged Arctic cold conditions. Consequently, three of the Great Lakes - Lake Superior, Lake Huron, and Lake Erie - froze over for the first time in nearly a decade. St. Lawrence Seaway officials decided to postpone its opening for almost a week, from March 25 to March 31, and hoped that the ice conditions would be alleviated by then. In Duluth Harbor, ice was more than 2 feet thick on the Duluth side and was even thicker on the Superior side. Winter 2004, so far has been colder than normal in the Great Lake region owing to the southerly path of the Jet Stream allowing cold Arctic air masses to penetrate into the northeastern U.S. This anomalous change in ice cover on the Great Lakes was observed and recorded during our GLAWEX1997, GLAWEX2002 and GLAWEX2003 field experiments on the upper Great Lakes. The objective of the experiments is to develop algorithms to map and classify ice using satellite synthetic aperture radar (SAR) and scatterometer data [2]. The large spatial extent of the Great Lakes and important connecting waterways demands the use of satellite SAR data to satisfy the required high resolution and large aerial coverage simultaneously. Moreover, the large spatial and high temporal coverage of satellite scatterometer measurements with its all-weather, day/night sensing capabilities make it well suited to map and monitor Great Lakes ice cover to extend the historical climatological record that was largely developed using aircraft observations.

REFERENCES

[1] R. Assel, K. Cronk, and D. Norton, "Recent trends in Laurentian Great Lakes ice cover," *Climatic Change* 57: 185-204, 2003.

[2] G.A. Leshkevich and S.V. Nghiem, "Radar remote sensing of Great Lakes ice cover," Proceedings: International Geoscience and Remote Sensing Symposium (IGARSS'02), IEEE, Toronto, Canada, June 24-28, 2002.


IGARSS 2004
2004 IEEE International
Geoscience and Remote
Sensing Symposium
IEEE
Getting Started
Welcome
Sessions
Citable Index
Authors
Search
20 - 24 September, 2004 • Anchorage, Alaska